

## SYNOPSIS OF THE CICINDELIDÆ

### I. General Introduction, Bibliography and Purpurea Group

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This is the first of a series of papers which, we hope, will eventually include all the species (and varieties) of tiger beetles known to occur in boreal America north of Mexico and exclusive of the West Indies, in other words the same field covered by Mr. Leng in his monumental work, "Catalogue of the Coleoptera of America 1920."

It would, undoubtedly, be preferable to publish one large paper on the entire family. However, the spare time of both authors is very limited, and we deemed it more desirable to publish our findings in the various groups in serial form rather than postpone the entire paper to a far distant date. Many new species, varieties and, unfortunately synonyms have been described since Mr. Leng's Revision\* and also two complete lists, that of Mr. E. D. Harris in 1911 and Dr. Walther Horn in 1930, but at present there is no up-to-date paper enabling the student to properly identify his "tigers" and giving at the same time the rather involved synonymy of this attractive and popular family. Thus the two main objectives of this paper are not only to fill the above need, but also to furnish a prelude for a complete monographic work on the Cicindelidæ of North America. In addition to the synoptic keys and synonymy, we include the briefest of individual descriptions, giving a few salient characters and also general remarks and approximate distribution of each species and variety.

We feel that the best results are obtainable by recognizing only species and varieties as is done in our check lists and most papers on North American insects. While it is true that certain species are more entitled to specific rank than others and some

\* Revision of the Cicindelidæ of Boreal America. Trans. Am. Ent. Soc. XXVIII, March, 1902.

varieties are more pronounced than others, nevertheless the attempt to "grade" these units into subspecies, phases, etc., generally leads to considerable confusion and only increases the present chaotic condition of most families of the Coleoptera to-day. It is difficult enough to get students to agree on what constitutes a species and what constitutes a variety without complicating the subject with further minor classifications and "split-ups." The object of this paper is to simplify matters and not to blunder around in long discussions and arguments most of which lead nowhere.

Dr. Walther Horn has listed our species in a most admirable and conservative paper, "Notes on the Races of *Omus californicus* and a List of the Cicindelidæ of America North of Mexico," Trans. Amer. Ent. Soc. LVI, pp. 73-86, 1930. His views are the antitheses of the late Colonel Casey and in our humble opinion much more preferable and accurate. By elevating his subspecies (listed with Roman numerals) to specific rank and considering his varieties (listed with letters) and phases (listed with symbols) as varieties, one has a complete check list of our forms. This applies especially to his excellent work on the genus *Omus* which otherwise would be in such a chaotic condition as to make it impossible for even a specialist to properly identify his material without weeks of study and examining the Casey types in Washington.

We have endeavored to be liberal in recognizing varieties. There are two distinct types of these varieties. One group is of those forms which, while occurring in the same localities as the stem species, nevertheless differ sufficiently either in color, markings, or more rarely size, as to warrant giving them varietal names. As an example the well-known green form so common to most of our eastern pine barrens *Cicindela scutellaris* var. *rugifrons* and the black form var. *modesta* occur together in most localities while in others only one is found. The other group consists of those forms which may differ greatly or very slightly, as the case may be, but are geographical races and never found with the stem species. We believe these varieties are much more important than the first group and represent future valid species although the present differences may be very slight.

Many examples of these are found in the *purpurea* group which is treated in this paper.

We do not condone recognizing the intermediates between species and varieties. In the North Eastern states, the maculated variety *rugifrons* is most often met with, while in Florida and the Southern States, the immaculate variety *unicolor* prevails. Occasionally specimens of each are met with in the territory of the others and as one would suspect the location between might have an almost even sprinkling of both forms. This is exactly the case in the Carolinas, and led Mr. Harris to describe variety *carolina*. We feel that this is wrong and unnecessary, and if the locality labels were removed it would be impossible to differentiate between lightly marked specimens taken in Massachusetts and Long Island, New York, and those from the South.

It is very undesirable to name sports, monstrosities and uniques in such a variable family as the Cicindelidæ.

In arranging the synonymy, we have left out all names of which no published description exists, that is names used in letters, written by individuals, which names have crept into our already overburdened synonymy.

We wish to thank for help either in putting museum material at our disposal or supplying valuable data Mr. Charles W. Leng, Mr. Andrew J. Mutchler, Mr. L. L. Buchanan, Mr. Herbert S. Barber, Mr. E. T. Cresson, Jr., Mr. C. A. Frost, Prof. H. C. Fall and Mr. Warren Knaus.

#### Cicindelidæ

Antennæ filiform, 11-jointed, inserted on the front above the base of the mandibles, which are long and sharply toothed: Clypeus produced laterally over the base of the antenna; hind coxæ mobile and simple; abdomen of female 6-articulate, of male usually 7-articulate.

The male genitalia used so much in recent years in the classifications of certain groups has not been greatly studied in the Cicindelidæ. Dr. Walther Horn, who has examined this member in the difficult *Omus* group, decided that it had only the same value as any other character and was equally subject to variation. We are entirely out of sympathy with those genitalia

enthusiasts who make or break a species on this character alone, entirely disregarding all other structures and differences.

Unquestionably the genitalia is helpful if taken along with or backed up by other differences and even geographical distribution, but the naming of species on this character alone is too preposterous in our minds to be taken seriously and we are forced to the conclusion that it has been seized upon as "a happy hunting ground" for splitters and confusionists.

In the final paper, (after we have published synoptic keys of all the species and varieties) we will publish a synoptic key of the tribes, genera and stem species only and also a list of all species, varieties and synonyms. Each paper will have a bibliography covering only those forms taken up in the particular article. The bibliography in this paper will also include the more important works on North American Cicindelidæ.

#### Genus *Cicindela* L. 58-407

##### The *Purpurea* Group

Humeral angles distinct; winged species; abdomen not red; thorax not margined; pubescence beneath erect; anterior tarsi male broadly dilated; labrum well developed; elytra granulate punctate; front hairy.

##### KEY TO PURPUREA GROUP

- Elytra with short oblique middle band (never with a marginal line) and usually an anteapical dot; thorax, head and elytra always the same or about the same color ..... (1)
- Elytra with middle band transverse at base; maculation complete to entirely immaculate, except for apical dot; thorax and elytra sometimes different in color, rarely with a marginal line ..... (2)
- (1) Reddish cupreous to bronzed ..... **purpurea**  
 Green often with slight cupreous reflections, especially pronounced on thorax ..... var. *auduboni*  
 Black ..... var. *nigerrima*
- (2) Elytra without marginal line ..... (3)  
 Elytra with marginal line ..... (12)
- (3) Elytra and thorax coppery reddish to a greenish sericeous shade ..... (4)  
 Thorax green to a French blue ..... (6)
- (4) Middle band sinuate, with or without anteapical, humeral and post-humeral dots ..... (5)  
 Middle band short and transverse ..... var. *transversa*

- (5) Color of elytra cupreous to bright red, usually rather brilliant and deep ..... **limbalis**  
 Color of elytra dull green to greenish suffused with cupreous giving a somewhat sericeous appearance (N. E., Ill., Wis.) ..... var. *spreta*  
 Color of elytra dull greenish to dull brownish cupreous, more deeply punctured, thorax more bronzed (Colo., N. Mexico) ..... var. *auguralis*
- (6) Thorax and elytra a different color ..... (7)  
 Thorax and elytra greenish (rarely both a greenish blue) ..... (9)
- (7) Elytra cupreous ..... (8)  
 Elytra green or greenish with blue side margins; head and thorax blue, markings usually consisting of faint transverse middle band to entirely immaculate except for apical dot (La., Ark.)  
var. *ludoviciana*
- (8) Maculations narrow, incomplete to entirely immaculate, except apical dot, usually consisting of short transverse middle band and apical dot, rarely with anteapical and post-humeral dots ..... **splendida**  
 Maculations complete, often quite broad; middle band distinctly sinuate; apical, anteapical, post-humeral, and often humeral dots generally present; head and thorax generally blue but sometimes green (Kan., Neb.) ..... var. *cyanocephala*
- (9) Immaculate except for apical dot or with markings short and inconspicuous; middle band when present transverse. Thorax densely pubescent ..... (10)  
 Middle band sinuate often long and broad ..... (11)
- (10) Immaculate except apical dot, rarely with small humeral dot.  
var. *propinqua*  
 Middle band short, transverse ..... var. *denverensis*
- (11) Middle band and other markings rather narrow; head and thorax not very pubescent; post-humeral dot generally missing ..... var. *pugetana*  
 Markings very broad, heavy, middle band very long and suddenly bent, greenish, generally tinged with cupreous thorax and head very hairy ..... **decemnotata**
- (12) Dull dark green to coppery or blackish with short broad branches indicating usual markings ..... **cimarrona**

**C. purpurea** Oliv. 90-14 (*marginalis* Fab. 01-240; *spreta* ≠ Lec. 57-37)

This common and widely distributed species is known to almost all beetle collectors and even general entomologists. *Purpurea* and its two varieties can be readily told from the other species by the very constant short oblique middle band. In very long intervals, an occasional specimen is taken lacking the middle band. We know of only one authentic record: namely, Mr. C. A.



Frost took a single example at Hopkinton, Massachusetts, April 13. This may be regarded as a sport, and as many typical specimens were found in the same locality, it carries no geographical significance. Specimens from New England and northern New York often show the tendency to verge on greenish, approaching the western variety *auduboni*.

Although common where found, and widely distributed, *purpurea* is moderately local. It occurs from Canada through Kentucky and Tennessee.

The range listed is from the Atlantic to the Pacific, but probably most or all of the west coast records refer to its varieties. Mr. Loding reports its absence in Alabama and it is not reported from South Carolina south or in the southwest or from California. In the vicinity of New York City it is found in the spring (April–May) and again in the autumn (end of August–September) disappearing pretty much during the summer months. Found commonly on old roads, especially in pine barrens of Long Island, New York, where some of the more brilliant phases are met with.

var. *auduboni* Lec. 45–207 (*graminea* Schp. 83–89; *lauta* Casey 97–296; *franciscana* Casey 13–23; *mirabilis* Casey 14–358)

This geographical variety can be told from *purpurea* only by its greenish color. The shade of green is quite often variable, depending somewhat upon the locality but varies usually very slightly in the same location. We cannot see any grounds for retaining *lauta*. When the senior author, who examined the type, asked Mr. Leng why this name was listed even as a variety he replied, “to be generous to Colonel Casey.” As Mr. Leng pointed out in the JOURNAL OF THE NEW YORK ENTOMOLOGICAL SOCIETY, Vol. XXVI, p. 139, this name was first given by LeConte to this green western variety but later applied also for the black variety (*nigerrima*, Leng). Consequently while it is feasible to separate this slight color phase because it is sustained also by a restricted range, we do not feel that different shades of color or size of specimens should be construed as warranting names. Some of the specimens verge on the bluish or have margins of elytra bluish. This applies especially to specimens from Cali-

fornia. We should not be surprised to hear of *auduboni* turning up sometime locally in the north east as well as out west. One specimen from the Catskill Mts., New York, in the senior author's collection is entirely a dull green and nearer *auduboni* than the true *purpurea*, but until more such specimens turn up, we will leave it as *purpurea*, thereby not extending its range for the present. All of Casey's *auduboni* are *nigerrima*, Leng.

Ranges from Kansas and Utah to the Pacific Coast. Also listed as being taken in Illinois and Minnesota. Mr. F. S. Carr has sent us some examples caught in Medicine Hat, Alberta, April 14-21. Other specific records are Brookings, S. D.; Stockton, April 20, Utah; Oakley, September 24, Kansas; Rapelje, September 1, Montana. Also many records from California to British Columbia.

var. *nigerrima* Leng, 18-139 (*auduboni* || Lec. 57-37)

The black variety having approximately the same range as *auduboni* except that it is taken sporadically but very rarely in the East. Mr. C. A. Frost reports one from Nobscot (Framingham), September 4, Massachusetts. The senior author took one at Lakehurst, September 6, New Jersey, when in the company of his good friend and collecting companion Mr. Ernest Shoemaker. Some eight species and 130 specimens of tiger beetles were bagged on that occasion, and in the field the author thought he had a partially maculated form of the pine barren *Cicindela consentanea* which is remarkably constant. This isolated specimen coming from the pine barrens of southern New Jersey (not the northern part of the state) and from such a thoroughly collected locality as Lakehurst was a great surprise. Also from Brookings, South Dakota; Denver, Colorado; Wyoming; Chicago, April 19, Illinois; Oakley, September 24, Kansas; Beaver Dam, September 11, Wisconsin; Ragton, New Mexico; Medicine Hat, April and Sept. (Carr), Alberta; Jefferson County, June 20, Montana.

C. *limbalis*, Klug, 34-29 (*amæna* Lec. 48-177; *splendida* ≠ Lec. 57-36; *awemeana* Casey, 13-23; *eldorensis* Casey, 13-23; *militaris* Varas, 28-242)

Markings mostly complete but often with the humeral, post-humeral and anteapical dots partially or entirely lacking. Middle band and apical dot always present, the former rather long and sinuate but transverse at base. Color varies from a cupreous to a distinct reddish and often specimens are found around New York City of either an Indian red or Cologne earth shade (brownish hues). Examples from the middle west appear duller and paler than those taken in the Atlantic States. Varas saw fit to honor certain specimens from the Atlantic States which lacked some of the usual dots and as he put it "had a violet hue" with the name *militaris*, but Horn relegated it (and in our opinion correctly) to synonymy. *Eldorensis* Casey, is a synonym also of *limbalis* and not *transversa*. In the Casey collection his *limbalis* from Connecticut is the variety *spretta*, while his true *limbalis* specimens were known to him as *amæna*.

This species is one of the most beautiful beetles found at least in the east. It is a strong flier and is met with around New York City locally along high and little-used roads, and the bare tops of the hills of the Hudson Valley and Greenwood Lake section of New Jersey during the spring (end of April–May) and again in the autumn (end of August–October 15). Also from Argentine, April–May, Kansas; Kansas City, March 24, Montgomery City, October 12, (Clark) Missouri; Iowa City, September 11, (Wickham), Iowa; Aweme, April 30 (Criddle), Manitoba; Edmonton, June 3 (Carr), Alberta; Cochrane, August 30 (Notman), Ontario; Malcolm, March 23, Nebraska; Nantucket, September 14, Massachusetts; Michigan; Ohio, Kentucky, etc. Apparently does not occur in the South Atlantic States or California.

var. *transversa* Leng, 02–131.

This variety is, to our minds, a very slight departure from the stem species *limbalis* but is worth retaining because it represents the intermediate or connecting link between this species and *splendida*. Its chief and only deciding character is the middle band being reduced to a short transverse line at the margin of the elytra. The various other dots are usually much less distinct than in *limbalis* and often all or most are entirely



absent. As might be imagined, intermediates are often encountered in Kansas (Argentine) which is apparently one of the rare localities where both *limbalis* and var. *transversa* and *splendida* and var. *cyanocephala* occur together. Certain specimens of *transversa* have the thorax with a brassy shine approaching the next species *splendida*. There is also a specimen in the collection of Mr. Ernest Shoemaker from the District of Columbia where *splendida* is found, but to our knowledge never *limbalis* (probably being just a little too far south).

Despite these geographical "alliances," we are of the opinion that Mr. Edward Harris was correct when he wrote his list of Cicindelidæ\* in placing *transversa* as a variety of *limbalis* and it is not a variety of *splendida* as construed by Walther Horn and followed by Leng in his check list, although he originally described it as a variety of *purpurea*, also placing *limbalis* as a variety of that species and regarding *splendida* as a good species. This certainly appears to be more natural and correct. In New York and New Jersey (where *splendida* has not been found) in a series of forty or fifty specimens of *limbalis* generally one or two turn out to be *transversa*. Therefore, while it is found in company with *splendida* at the meeting point of this southern species and *limbalis*, *transversa* is found more often in company with the more northern *limbalis* where *splendida* is never taken. Lawrence, Argentine, March through May, Kansas; Eureka, April 30 (Smyth), Missouri; District of Columbia; Greenwood Lake, May 4, (Nicolay) New Jersey.

var. *spretta* Lec. 48-177.

It is advisable to retain this name to separate that form, occurring only in the northeast, which has the usual cupreous color more or less suffused with green. The markings appear remarkably constant and complete and the elytra are duller and less shining than the typical *limbalis*. Although it is not correct to apply this name to the dark forms of *limbalis* found around New York City, we would include the more brownish or alutaceous specimens found in company with the true *spretta* by Harris at Mount Desert, Maine, in August.

\* Truan Press, Yonkers, N. Y., 1911.

Monmouth, June 24 (Frost), Maine; Westfield, May 19 (Notman), New York; Ravina, July 16, (Liljebblad), Illinois; Wisconsin.

var. *auguralis* Casey, 13-21 (*inducta* Casey, 13-22; *ardelio* Casey, 13-21)

A western variety which can be separated by characters given in the key. It is hard to understand why Casey described it as a variety of *purpurea* with the resulting incorrect synonymy in the Leng list of Coleoptera.

Described from, and so far known only from, Colorado and New Mexico. Walther Horn in his 1930 list of North American Cicindelidæ apparently included the dull form of *limbalis* from Kansas under this variety. Our minds are open on the ultimate correctness of this but until more material is collected, we prefer to leave Kansas specimens under the name *limbalis*.

**C. *splendida*** Hentz, 30-254 (*discus* Klug, 34-23)

This beautiful species and its varieties can be told from all others of the group by the green or bluish thorax. It is southern in its range and, undoubtedly, all records in the East north of the District of Columbia and vicinities (it may be found in Maryland when this state is more thoroughly collected) are erroneous. As an example of how easy it is to list incorrect localities, there is a specimen in the American Museum, New York, marked "Br. Col." undoubtedly referring to the "District of Columbia." Specimens from Kansas and Nebraska usually have a more brassy sheen than those from the South Atlantic States. The thorax is a uniform light green on the many specimens taken in Virginia by the senior author while those seen from Kansas and Nebraska range from a deep French blue to bluish green and rarely light green as in eastern specimens. We certainly hope that no future "splitter" decides to honor these colors with a name. They are interesting but of no decided geographical value. In looking over the Casey collection, we find that all his "*splendida*" with the exception of one or two doubtful examples are the variety *cianocephala*.

*Splendida* is very faintly and finely marked as compared with *C. limbalis* and in this respect approaches of course *C. limbalis*

var. *transversa*. Usual markings consist of short transverse middle band apical dot and more rarely anteapical dot. One specimen from Mount Vernon, Virginia, taken by the senior author has the middle band narrow but decidedly sinuate and a posthumeral dot thus approaching the variety *cycanocephala* so far only recognized from the west. Occasional specimens appear entirely immaculate, but a bath in chloroform or benzine removes the grease and usually shows at least a trace of the short middle band.

Douglas, Lawrence, McPherson, Argentine, Kansas; Denver, March 26 (Ellis), Colorado; Imboden, April 26 (Marshall), Hope, November (Knobel), Arkansas; Lexington, October (Birkmann), Texas; Asheville, May 19, North Carolina; Mount Vernon, April-May and September (Shoemaker, Nicolay), Virginia; Kingfisher, Oklahoma; Willard, March, Missouri; Nebraska.

var. *cycanocephala* Varas, 28-239 (*amoena* ≠ Harris, 11-8)

This is the *amœna* of Harris and of the Leng list. The mistake occurred by temporarily incorrect labeling of the type in the LeConte collection in Cambridge after his death. We understand that the mistake has been corrected and consequently the type of *amœna* to-day checks with LeConte's description and is a synonym of *limbalis*. This discrepancy of type and description greatly puzzled Mr. Edward Harris.

*Cycanocephala* differs from *splendida* in that the middle band is sinuate and markings are usually quite broad and complete as in *C. limbalis*. The head and thorax are usually a beautiful French blue but green is quite often met with also. This variety has the same relationship to *splendida* that *C. limbalis* has for its variety *transversa*.

Omaha, April, Lincoln, Malcolm, March through May (Oertel) Nebraska; McPherson, March (Knaus), Topeka (Smyth), Argentine, April, Kansas.

var. *ludoviciana* Leng, 02-131.

A very local and evidently quite rare variety. Markings about as in *splendida*. Possibly the average is less maculated, consisting of merely a small transverse dash at middle and a transverse

apical dot. This is the first of the four varieties of *splendida* having the elytra green. The head, thorax and side margins of the elytra are blue giving the form a very pretty appearance.

Miss Louise Knobel reports that this variety flies much further and faster than *splendida* when disturbed. It is also much rarer and whereas *splendida* can be found in great numbers at Hope, Arkansas, during October and November, one is lucky to get two or four *ludoviciana* during a season's collecting.

Hope, October through November (Knobel), Arkansas; Vowells Mill, April and September (Coverdale), Louisiana.

var. **propinqua** Knaus, 22-194 (*arida* Davis, 28-65)

Light green usually with slight golden sheen. Legs and thorax (except top) covered with a dense, white, erect vestiture. Elytra immaculate except usual transverse apical dot; one specimen has very small humeral dots; dull not shining. Length 9 mm., width 3.5 mm. As mentioned in the original description, the variety is very close to *denverensis* and is incorrectly placed in the *tranquebarica* group by Dr. Walther Horn. The authors are much indebted to Mr. Warren Knaus for sending us his unique type for inspection as well as a paratype of *Cicindela arida*, proving it to be a synonym. In his description of *arida*, Davis remarked that "it was apparently in *tranquebarica* group," but the black palpi of male, deeply granulate punctate elytra and general appearance prove its association with *purpurea*.

Ash Meadow, Nye Co., August 16 (Nininger and Hoover), Nevada; Death Valley Junction, March 31 (Gunder), California.

var. **denverensis** Casey, 97-297 (*graminea* ≠ Casey, 13-21; *conquisita* Casey, 14-357; *oreada* Casey, 14-358)

Larger and with a longer body than *propinqua*. Vestiture of thorax less dense and long. Elytra usually light green, sometimes dark bluish green, dull. Markings consisting of short transverse middle band. Occasionally post-humeral and ante-apical dot present and markings broader (*conquisita* and *oreada*). Although considered as an "abundantly" distinct species by Colonel Casey, *denverensis* may be traced through *ludoviciana* as merely another variety of *splendida*.

Denver, April and May, Colorado; Sioux County, Nebraska; Kansas.

var. *pugetana* Casey, 14-20.

Differs from the two preceding green varieties in that the head and thorax are much less densely pubescent. Middle band is distinctly sinuate. Green of elytra more shiny and brighter, not dull as in *denverensis* and *propinqua*. Casey also considered the black palpi as of some significance but as he described *pugetana* from a single example this can not be accepted until more material is available. *Pugetana* is spelled "*pugitana*" on the type, which is a small male. Specimens collected by Mr. Gibson and sent to the senior author through the kindness of Mr. C. A. Frost are larger, possibly because they come from farther south (Washington). One of the three specimens has the lunule missing. Known from the Northwest.

British Columbia; Buena, April 13 (Gibson), Washington. Also listed from Montana, Idaho and Wyoming by Dr. Walther Horn.

**C. decemnotata** Say, 17-19 (*lantzi* E. D. Harris, 13-68; *albertina* Casey, 13-24)

Dull green, usually tinged with cupreous. Markings broad and heavy, middle band very long and suddenly bent. Thorax rather hairy. Some specimens have the dull green of the elytra margined with bright green or blue. Specimens sent by Mr. F. S. Carr from Medicine Hat, Alberta, are remarkably constant as to size, color and markings. Some forms are found, however, in which the humeral and post-humeral dots are missing and more rarely the middle band may be reduced to a marginal spot thus approaching *pugetana* and along with the placement of the hairs proving its connection with *splendida* and the whole *purpurea* group.

Recorded from Alaska to Wyoming, Nebraska, Utah, Kansas and California. Medicine Hat, April 21-26 (Carr), Alberta, Canada.

**C. cimarrona** Lec., 68-49.

Easily told from all other species and varieties by the distinct marginal lines of the elytra and the short and abrupt branches,



indicating the usual humeral lunule, middle band and apical lunule. Color black to a dull green, usually with a coppery lustre.

Jemez Springs, July 24, New Mexico; Creede, August, 8844 feet (Hunter), Colorado, also Arizona and Southwest Utah.

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*C. tanneri* (Jour. Kansas Ent. Soc., Vol. 2, No. 2, April, 1929, pp. 47-48) was described by Knaus as being very close to *wil-listoni* and therefore should not be placed as a phase or variety of *C. decemnotata* as is done by Dr. Walther Horn with a question mark.

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